

BOOK REVIEWS

THE QUATERNARY HISTORY OF SCANDINAVIA by Joakim Donner, Cambridge University Press, Cambridge, 1995. No. of pages: 200. Price: £60.00 (hb). ISBN 0-521-41730-9.

This volume provides a regional overview of the Quaternary in Denmark, Norway, Sweden and Finland. Such an overview has been lacking, so its publication is extremely useful for any researcher dealing with the Quaternary of Scandinavia. Treatment of glacial and interglacial periods is well balanced; the author is a well known expert in both fields, and the text is scientifically sound and well written.

In major parts of Scandinavia, the Pleistocene ice sheets have repeatedly removed most of the older sediments. Consequently, most of the text (112 pages) is devoted to the last (Weichselian) cold stage and the subsequent deglaciation. A detailed survey of the glacial history is presented, with a discussion of the extent of Early and Middle Weichselian glaciation. Discussion of the deglaciation history includes the varve chronology and time markers such as the Vedde Ash (10–6 ka BP) and Laacher See Tephra (11 ka BP). In recent years many sites have been identified that shed light on the Quaternary history of Scandinavia prior to the last glaciation; deeply disintegrated bedrock in Sweden and Finland bears witness to pre-Quaternary weathering. In Denmark two sites preserve Comerian Interglacial sediments. Deposits of the Holsteinian (Hoxnian) Interglacial have been identified in Sweden, Finland, Estonia, Latvia and Lithuania, as well as Denmark and Germany. Saalian

(Wolstonian) tills are preserved in numerous places throughout Scandinavia, and present knowledge of the Eemian (Ipswichian) allows a well-founded reconstruction of the last interglacial predecessor of the Baltic Sea. The Eemian Baltic Sea was larger than today and connected via Lakes Onega and Ladoga to the White Sea.

The text reviewing these issues is illustrated by over 80 figures, and all line drawings have been redrawn for the book including numerous useful maps giving an overview of Scandinavia and the locations mentioned in the text. Some figures are a little over-simplified, such as the diagram of the amino acid ratios (fig. 15.2) in which the error bars of the original have been omitted. The photographs are beautiful; it would have been excellent to have had more of them. Over 1200 references provide a key for any prospective scholar of the Scandinavian Quaternary. As the author speaks all the languages in question, the list contains many titles in Finnish, Swedish, Norwegian, Danish and German, which might easily escape the attention of an English-speaking audience. Because the preparation of a book like this takes a long time, the most recent references are only from 1992. The index is rather short (about 200 entries) and does not include place names. However, overall the book is highly recommended to any reader who wants an up-to-date overview of the Scandinavian Quaternary.

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DRIFT EXPLORATION IN THE CANADIAN CORDILLERA edited by P. T. Bobrowsky, S. J. Sibbick, J. M. Newell and P. F. Matyssek, Mineral Resources Division, Geological Survey Branch, Ministry of Energy, Mines and Petroleum Resources, British Columbia, 1995. No. of pages: vi + 303. ISBN 0-7726-2368-6.

A few years ago, whilst on an INQUA field trip in southern Saskatchewan, Canada, we were informed that the Canadian Geological Survey was diamond prospecting in the till, and I viewed these deposits in a completely different light. Suddenly every piece of quartz became a potential gem, and I was struck with 'gold fever'. However, of course, the field trip findings were intellectual in nature, and so I welcomed the chance to review this more sober approach to drift exploration.

Any applied aspect of geomorphology requires both a good grounding in the basic principles (here, till depositional

processes), and a creative use of these ideas to solve environmental problems. This is emphasized in this book's foreword, which suggests 'successful mineral exploration in a Quaternary-dominated terrain requires an appreciation and understanding of the surficial sediment cover, glacial history, glacial dispersal theory and soil formation'.

The collection of papers begins with a series of mainly 'mapping' papers, then a series of 'techniques' papers, beginning with traditional field and laboratory techniques and ending with geophysical techniques. The final section is a useful bibliography of drift prospecting activities. This collection of papers is very useful for those interested in drift prospecting, both in research and in industry. Students will also be interested, because it provides a very good introduction to the subject. The papers are very well illustrated, many containing interesting photographic stereo pairs. They also describe many impressive excavating tools, including the backhoe and rotasonic drill, which have produced good sections and cores.

However, the main problem with the collection is that few of the papers refer to modern ideas in glacial geomorphology, and few suggest how the till is deposited (understanding of which is vital to explaining the transport of erratics). Two notable exceptions are the papers by Martin Rappol, on the processes of sedimentation, and Peter Bobrowsky, on lithological analysis. Most of the papers are written by authors who have worked in applied aspects of glacial geomorphology (without a modern analogue and/or process experience base). There is therefore clearly a need for more links between pure and applied researchers in glacial geomorphology.

My final query relates to the time and money (apparent from the expensive excavating tools) being spent on drift prospecting. Can data from these sections be used to increase our knowledge of glacial sedimentary processes (with the

results being published elsewhere), or is drift prospecting an end in itself? What effect does this prospecting have on the environment? Only one of the papers (by Alan Plouffe) addresses these issues, in the sense that the damage to the environment was a factor to be considered when choosing a site to investigate.

In conclusion, this is an interesting collection of papers about drift prospecting, which would be directly useful for applied geomorphologists. Many of the discussed techniques could be used by both pure and applied researchers. Students will also find it informative, and I therefore suggest that it is a useful addition to any academic library.

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HORACE-BENEDICT DE SAUSSURE, FORERUNNER IN GLACIOLOGY by A. V. Carozzi and J. K. Newman, *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève*, Volume 48, Editions Passé Présent, Geneva, 1995. No. of pages: xii + 149. ISSN 0252-7960.

The subtitle of this book explains its content and purpose: 'New manuscript evidence on the earliest explorations of the glaciers of Chamonix and the fundamental contribution of Horace-Benedict de Saussure to the study of glaciers between 1760 and 1792'. It presents painstaking archival research that throws light on the early development of glaciology. French and Latin sources are given in the original and in translation, and de Saussure's manuscript notebooks are mined for references to glaciological phenomena. De Saussure is shown to have anticipated concepts of firnification and subglacial hydrology, and in the face of opposing views, to have understood that glaciers move down-valley as upglacier ice replaces that which melts downglacier. He introduced terms such as *sérac*, *moraine*, *roche moutonnée*. There is also much here that illustrates the early development of methodology in this science. Having visited Chamonix

briefly in 1760 and 1761, de Saussure systematically planned a research visit in 1764, and his notebooks reveal a list of 15 broad objectives focusing on the nature of the glacier, its shape and position, its size, and related observations. It is evident that he was not merely gathering data; he was theorizing and testing hypotheses. Why else would he wish to 'observe if the snow is not arranged in layers or in thin sheets and what is the direction of these layers'? His subsequent observations of meltwater streams issuing from glaciers, and of the ploughing action of glaciers building what are now referred to as push moraines, confirmed his view of glaciers as sliding down-valley on a sheet of water, and he interpreted glacier motion in terms of a balance between gains and losses a century before G. K. Gilbert's supposedly seminal introduction to the Earth sciences of equilibrium concepts. He was also conscious of environmental change, but aware that some glaciers were advancing while others retreated. There are many moments to savour in browsing through this book for anyone interested in the history of glacial studies and of Earth science.

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CLAY AND SHALE SLOPE INSTABILITY edited by William C. Haneberg and Scott A. Anderson, GSA Reviews in Engineering Geology Series, The Geological Society of America, Boulder, Colorado, 1995. No. of pages: v + 158. Price: \$60.00 (hb). ISBN 0-8137-4110-6.

This collection of papers arises from a symposium of the Engineering Geology Division of the Geological Society of America, held in 1992. The broad aim of the volume, as with other recent *Reviews in Engineering Geology* on neotectonics in earthquake evaluation (Krinitzsky and Slemmons, 1990) and landslide mitigation (Slossen *et al.*, 1992), is to provide state-of-the-art information on a particular subject area, in this instance clay and shale hillslope processes. Three of the chapters are based on symposium talks, with seven post-

symposium contributions. The papers are diverse in content. Some describe qualitative and other quantitative studies; some are based on field testing and others laboratory analysis; two focus on modelling.

Although the topics are varied, four broad themes emerge from the book. The first is field studies of instability and landslide movement. Baum and Reid (Chapter 6) examine the geology, hydrology and mechanics of a slow-moving, clay-rich landslide in Honolulu, concluding that movement activity is related to the duration and frequency of rainfall events and consequent changes in pore-water pressure. Bertocci *et al.* (Chapter 7) deal with landslides on clay and shale hillslopes in Tuscany, Italy. Results suggest that for shorter mudslides on gentler slopes instability is a consequence of undrained loading, while for larger features palaeoclimatic factors may have to be taken into account. The